

MEPE 301 (A) Power Electronic Converters

Unit-I: Single-Phase & Three-Phase Converters:

Single phase & Three Phase half controlled & fully controlled converters, input power factor & harmonic factor, continuous & discontinuous load current , single phase & three phase dual converters , power factor improvements , extinction angle control , symmetrical angle control , single phase sinusoidal PWM , single phase series converters , three-phase PWM, twelve phase converters , applications & numerical problems

Unit-II: AC Voltage Controllers & Cyclo-Converters :

Single phase AC voltage controllers: Analysis of controllers with resistive, resistive-inductive and resistive-inductive-induced EMF loads, AC voltage controllers with PWM control, effects of source and load inductances, synchronous tap changers, applications & numerical problems.

Three Phase AC Voltage Controllers: Analysis of controllers with star and delta connected resistive & resistive-inductive loads, effects of source and load inductances, applications & numerical problems.

Cyclo-Converters: Analysis of single phase to single phase midpoint and bridge configurations cyclo-converters , analysis of three phase to three phase midpoint and bridge configurations , limitations, advantages & applications

Unit-III: D.C. to D.C. Converters:

Principal of operation of chopper, step-up & step- down dc to dc converters with resistive and resistive-inductive loads, analysis of buck, boost & cuk regulators, comparison of regulators, advantages & applications of regulators, Multi-output boost converters, condition for continuous inductor current and capacitor voltage, numerical problems.

Unit-IV: Multilevel Inverters:

Multilevel concept, classification of multilevel inverters, diode clamped multilevel inverter -principle of operation& main features, improved diode clamped inverter – principle of operation & main features, flying capacitors multilevel inverter – principle of operation & main features, cascaded multilevel inverter – principle of operation & main features, applications of multilevel inverters ,comparisons of multilevel converters.

Unit-V: DC Power Supplies:

Classification of DC power supplies, switched mode dc power supplies, fly back converter, forward converter, push-pull converter, half bridge converter, full bridge converter, resonant dc power supplies, bidirectional power supplies, applications and advantages.

References:

1. Power Electronics and motor control – Shepherd, Hulley, Liang – II Edition Cambridge University Press.
2. Electronic motor drives modeling Analysis and control – R. Krishnan – I Edition Prentice Hall India.
3. Power Electronics circuits, Devices and Applications – MH Rashid – PHI – 1 Edition 1995.
4. Fundamentals of Electric Drives – GK Dubey Narosa Publishers 1995
5. Power Electronics- PS Bhimbra
6. Power Electronics – Ned Mohan, Tore M. Undeland and William P. Robbins – John Wiley and Sons – Second Edition.

MEPE 301(B): Micro-Controllers Based Power Electronics

Unit-1: Evolution of micro-controllers, comparison between micro processor & micro controllers, micro-controller development systems, 8051, 8096-architecture & hardware description, addressing modes, terminology, linear addressing, segmented addressing and stack addressing.

Unit-1I: Interrupt structure and timers, assembly language programming, C program structure, data acquisition.

Unit-III: Power supplies and electric motor drives control using power electronic converters

Unit-1V: Instruction set, arithmetic operations, logical operations, data transfer operations, control transfer operations.

Unit-V: Microcontroller interfacing to LCD ADC DAC chip stepper motor key board.

References:

- 1 K.J. Ayala, The 8086 microprocessor : programming and interfacing the PC, Pen ram International.
2. K.J. Ayala, The 8051 microcontroller: Architecture, programming and applications, Pen ram Int.
3. Raj Kamal, The concepts and features of microcontrollers (68H11, 8051 & 8096), Wheeler publishing.
4. Douglas Hall, Microprocessor & Interfacing, TMH
5. Kenheth J. Hintz and Daniel Tabak, 'Microcontrollers-Architecture, Implementation and programming' McGraw Hill, USA, 1992.
6. Joh n.B.Peatman,' Design with microcontrollers', McGraw Hill International Ltd, 1989.

MEPE – 302 (A) EHV AC and DC transmission

Unit-I: Configuration of EHV ac & dc transmission links, types of d.c. links, types of hvdc system, choice of hvdc transmission system, limitations and advantages of a.c. and d.c. transmission, principal application of a.c. and d.c. transmission, trends in ehv a.c. and d.c. transmission, power handling capacity., firing angle control.

Unit-III: Travelling waves on transmission systems, their shape, attenuation and distortion, effect of junction and termination on propagation of traveling waves, over voltages in transmission system, lightning, switching and temporary over voltages, control of lighting and switching over voltages.

Unit-II: Extra long distance lines, voltage profile of loaded and unloaded line along the line, compensation of lines, series and shunt compensation, shunt reactors, tuned power lines, problems of extra long compensated lines, fact concept and application.

Unit-IV: Calculation of inductance: inductance of single phase two wire line, inductance of three phase transposed line with symmetrical and unsymmetrical spacing, numerical, GMR, rural electrification in India.

Unit-V: Definitions of load management, DSM, load shaping and plant factors, load curves, supply side management opportunity, load management techniques, energy storage and energy release.

References:

1. Begmudre, EHV AC Transmission.
2. S. Rao, EHV AC & DC Transmission & distribution, khanna publishers.
3. Arrillaga, HVDC Transmission.
4. Padiyar, K.R., 'HVDC transmission systems', Wiley Eastern Ltd., New Delhi, 1992.
5. Kimbark, E.W., 'Direct current transmission-vol.1', Wiley Interscience, New York, 1971.
6. Arrilaga, J., 'High voltage direct current transmission', peter pereginver Ltd., London,U.K. 1983.

MEPE-302(B) Energy Efficient Electrical systems

Unit-I: Types of electric motors, losses in induction motors, motor efficiency, factors affecting motor performance, rewinding and motor replacement issues, energy saving opportunities with energy efficient motors. Electrical system: electricity billing, electrical load management and maximum demand control, power factor improvement and its benefit, selection and location of capacitors, distribution and transformer losses, energy audit in electrical systems.

Unit-II: Compressed Air System: Types of air compressors, compressor efficiency, efficient compressor operation, compressed air system components, capacity assessment, leakage test, factors affecting the performance and savings opportunities hvac and refrigeration system: vapor compression refrigeration cycle, refrigerants, coefficient of performance, capacity, factors affecting refrigeration and air conditioning system performance and savings opportunities. vapor absorption refrigeration system: working principle, types and comparison with vapor compression system, saving potential.

Unit-III: Fans, Pumps and blowers: Types, performance evaluation, efficient system operation, flow control strategies and energy conservation opportunities:

Unit-IV: Cooling Tower: Types and performance evaluation, efficient system operation, flow control strategies and energy saving opportunities assessment of cooling towers.

Lighting system: light source, choice of lighting, luminance requirements, and energy conservation avenues.

Unit-V: Diesel Generating system: Factors affecting selection, energy performance assessment of diesel conservation avenues, energy audit in fans, blowers, compressors & pumps.

References:

1. Energy Auditing Made Simple by P Balsubramaniam
2. Power Plant Performance by A B Gill
3. An Introduction to Thermodynamics by Y V C Rao
4. Energy Management by W K Murphy & G Mckay
5. Energy Reduction through improved Maintenance Practices by Bannister
6. Energy Efficiency in Electrical Utilities by BEE